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JOURNAL of the WASHINGTON ACADEMY of SCIENCES

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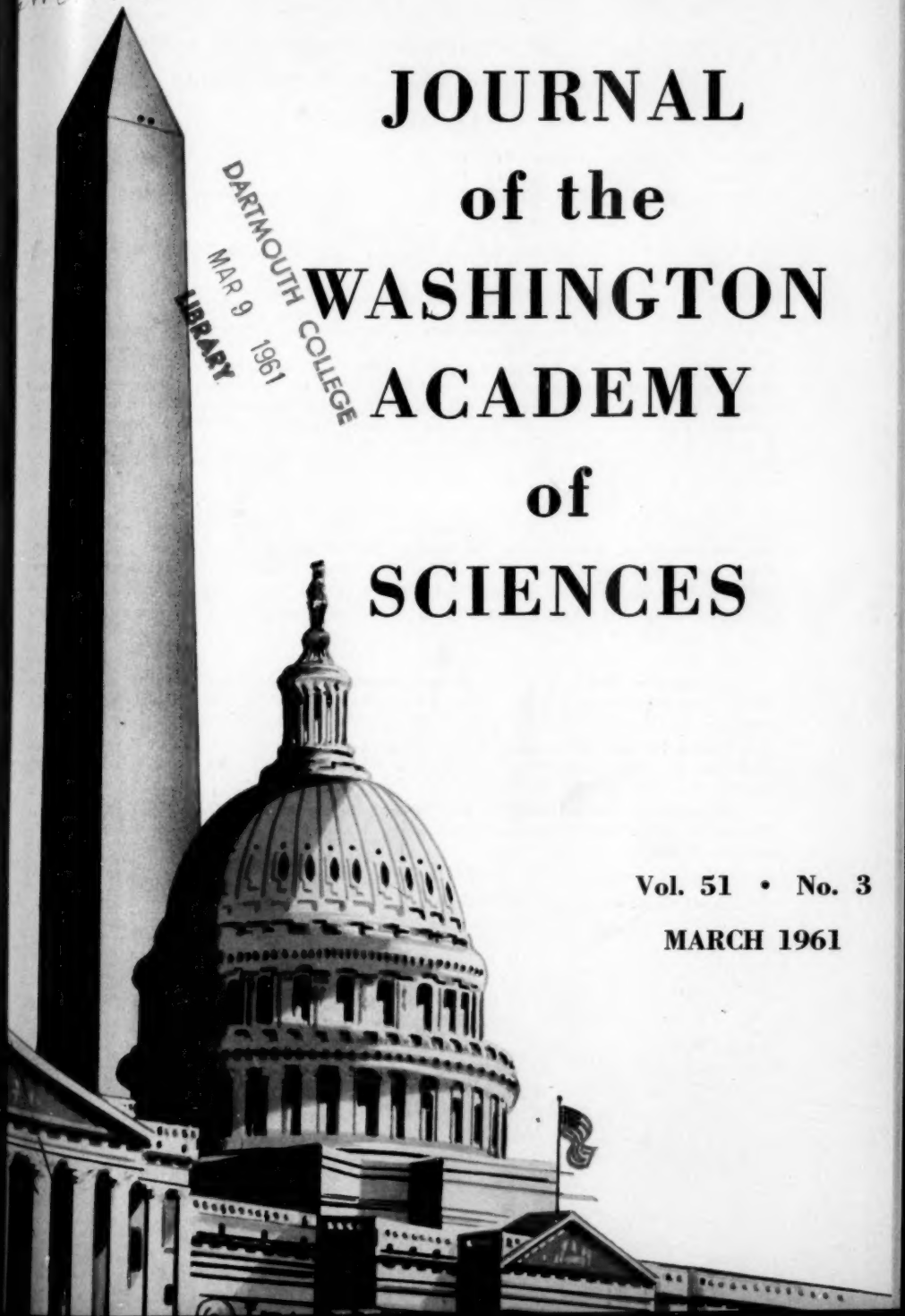

Vol. 51 • No. 3
MARCH 1961

JOURNAL OF THE WASHINGTON ACADEMY OF SCIENCES

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This Journal, the official organ of the Washington Academy of Sciences, publishes historical articles, critical reviews, and scholarly scientific articles; notices of meetings and abstract proceedings of meetings of the Academy and its affiliated societies; and regional news items, including personal news, of interest to the entire membership. The Journal appears eight times a year in January to May and October to December.

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A Message from the Incoming President—

The Academy's Program for 1961

Philip H. Abelson
Geophysical Laboratory

Metropolitan Washington is potentially one of the great scientific centers of the world. Our colleagues participate in creative research and in administrative decisions which have impact throughout this nation and the globe. The huge Government laboratories, together with increasing non-governmental activity, provide employment for perhaps 20,000 scientists here. This is of the same order of magnitude as in the Boston and New York areas.

Unfortunately, the Washington scientific community is only moderately effective in cooperative efforts having major impact. Our performance, when judged in the light of Boston or New York, is relatively weak. The American Academy of Arts and Sciences with its Daedelus has sowed seeds which are now coming to fruition in affecting national policy on disarmament, and had a significant role in the appointment of Dr. Wiesner as the President's Science Adviser. The New York Academy has long sponsored imaginative symposia which have foreshadowed major developments in new areas of science.

The Washington Academy of Sciences is one of the few organizations which can speak for science in Washington and can take action for the whole community. It has made notable contributions in the past, and has been particularly successful in recent years in the encouragement of young science talent through such activities as the Junior Academy of Sciences. This is an activity which should continue.

However, an even greater effort needs to be focused on the revitalization of the senior Academy. One area which needs thought and effort is the fostering of fellowship among the members of our community. I have often noted an important contrast between Boston and Washington. The members of the northern city have far more intensive intellectual and social contacts than do we here. They are far more aware of the resources of the community, and far better informed as to the qualities of their colleagues. As a result they are able to support each other effectively in various ventures. When important positions become available in Washington or elsewhere in the nation, they are able with clear conscience to recommend one of their colleagues.

An analysis of the successes and failures of other communities would doubtless be valuable, and will be undertaken. However, we shall not dwell on it further here, but will indicate some of the things we have already decided to do during this year. One of the steps which will be taken is a determined drive to increase our membership, particularly among younger men who are active in the affairs of the affiliated societies. A more vital group would have increased potential for constructive projects.

A second effort will be to increase the quality and number of our inter-disciplinary meetings. These are one of our best ways of bringing together in friendly contact the creative minds of our community.

A third action will be to give all possible support to building up the *Journal* of the Washington Academy of Sciences. We are fortunate in having an excellent editor, and he merits every financial and other cooperation.

In these undertakings I shall have the benefit of much advice and assistance from chairmen and members of various committees. The tasks, however, are large, and we shall appreciate and welcome suggestions and offers of help from everyone.

Unorthodoxy in Science*

Lawrence A. Wood

National Bureau of Standards

I. Introduction

The scope and magnitude of modern science are truly tremendous. We all know of the years required for an individual to assimilate what is called the generally accepted scientific knowledge in even a very strictly limited field. Not often is consideration given to the question of what we mean by the glib phrase "generally accepted" or how a given concept attains that exalted state.[1] It is certainly very interesting and perhaps instructive to examine a number of cases in which the concepts have run counter to the generally accepted scientific principles of their time. In other words, I invite your attention to unorthodoxy in science.

II. The Acceptance of Scientific Ideas

At first sight, the term orthodox seems out of place in a scientific connotation. After all, we pride ourselves on eliminating subjective influences in science, and it should make no difference whether or not we hold the "right opinion"—the literal meaning of orthodoxy.

However, the actual history of the acceptance of a scientific concept is conditioned throughout by the fact that scientists are human beings subject to errors, emotions, beliefs, and pride.

I. Bernard Cohen, professor of the history of science at Harvard, has said:[2] "Any suggestion that scientists so dearly love truth that they have not the slightest hesitation in jettisoning their beliefs is a mean perversion of the facts." If this is true, we may well ask the question: "Who is to determine the generally-accepted position in scientific matters?" In actual practice in recent times, it is the program committees, the journal editors and reviewers, and the textbook writers. They are forced by considerations of space to determine whether it is permissible to devote space to a given doubtful concept.

III. Examples of Unorthodoxy in Science

Let us examine twelve instances of individuals who propounded ideas that were regarded as distinctly unorthodox at the time they were proposed.

1. *Copernicus.* — The first unorthodox idea I shall mention was that of the heliocentric universe propounded by Copernicus about 1530. It was distinctly at variance with the geocentric universe of Aristotle, which had dominated men's thinking for over 1800 years. It became quantitative with the careful astronomical observations of Tycho and Keppler. Thus it gained general acceptance in about 100 years.

2. *Galileo.*—Galileo in about 1590 also ventured to contradict the authority of Aristotle by denying that a heavy body necessarily falls faster than a light one. The famous direct observation of falling balls from the Tower of Pisa apparently led to acceptance of this unorthodox idea fairly quickly and established the modern principle of verification by experiment.

3. *Young.*—Thomas Young in 1801 presented evidence for the wave theory of light. He found it difficult to obtain a hearing because Sir Isaac Newton was cited as favoring the corpuscular theory. Experimental evidence of interference by Fresnel and polarization effects established the wave theory quite firmly.

4. *Mayer, Joule, and Helmholtz.*—The

* Address of the retiring president at the 455th meeting of the Washington Academy of Sciences, February 16, 1961.

tremendously important theory of the conservation of energy, so fundamental to modern physics, also found acceptance only with difficulty. The theory was first put forth by R. J. Mayer, who in 1842 published an article proposing the equivalence of heat and mechanical energy and calculating a numerical value of the equivalence factor from observed specific heats. No particular attention was given to this paper until 1847, when J. P. Joule and H. Helmholz independently presented papers with the same conclusion. Helmholtz' paper, presented before the Physical Society of Berlin, was rejected by the editors of *Annalen der Physik* and later published in pamphlet form. However, the theory, once understood, gained rather rapid acceptance and has only rarely been questioned since 1850.

5. *Pasteur.*—In the biological sciences one can point out that the germ theory of Louis Pasteur found strong opposition from the medical profession of his day, which adhered to "spontaneous generation" and other vague ideas. Pasteur calmly performed critical experiments of many kinds and gradually established his point.

6. *Planck.*—At the beginning of the current century, Max Planck was considering the distribution of energy radiated by a perfect emitter ("black body") at various temperatures. In order to obtain agreement with the observed energy distribution, he was forced to make the assumption that the energy of small oscillators could take on only discrete values 0, $h\nu$, 2 $h\nu$, 3 $h\nu$, etc., where ν is the frequency of the radiation and h a constant. This assumption was completely at variance with classical mechanics, which gives no basis for such a limitation. Naturally it did not receive ready acceptance. However, Einstein's explanation of photoelectric emission in 1905, Bohr's quantum theory of atomic structure with its explanation of the wavelengths of spectral lines in 1913, and finally the experimental evidence of the Compton effect of change of wavelength of radiation on scattering in 1923, provided the bases for full acceptance of the theory.

7. *Blondlot.*—In 1903, at a time when scientists were just becoming familiar with α-rays, β-rays, γ-rays, and X-rays, a distinguished French professor, R. Blondlot at the University of Nancy, announced the discovery of N-rays [3, 4]. These were said to have remarkable properties, and over 200 papers were published relating to them. They were reported to be emitted by metals, rubber, and many other materials, although never by wood. Some authors reported that they could be refracted and diffracted, and would penetrate black paper, wood, and aluminum.

R. W. Wood, professor at Johns Hopkins University, arranged to visit Blondlot in his laboratory at Nancy in 1904. He found that Blondlot was still observing a spectrum of N-rays after Wood had surreptitiously removed the prism refracting them [4]. This observation, duly reported in German, British, and American scientific journals, dealt a death-blow to N-rays.

8. *Ehrenhaft.*—The accurate measurement [5] of the charge on the electron was one of the most important tasks in physics in the years preceding 1920. An unorthodox position in this field was taken by F. Ehrenhaft of Vienna, who reported measurements on metal particles allegedly bearing charges less than that of a single electron. This "sub-electron" was the subject of controversy for several years, but the careful measurements of R. A. Millikan on oil drops were finally accepted as more reliable.

9. *Klingelfuss.*—A series of unorthodox papers by F. Klingelfuss of Basel [6] were published in 1929 and 1930 in *Zeitschrift für Physik*. From experimental results on the minimum potential required for a spark in air, equations were derived involving various atomic constants. By manipulation of the equations, new fallacious relations were obtained which did not involve the results of the measurements of sparking potentials. From the new equations, values of the atomic constants were calculated to as many as seven significant figures.

10. *Rupp.*—E. Rupp, one of the pioneers

in German research on electron diffraction, published a series of papers in 1934 on the polarization of electron beams, artificially-produced positrons, and related topics. When no other workers could reproduce the results reported, Rupp withdrew the papers after undergoing a psychiatric examination.[7]

11. *Rhine.*—Among unorthodox concepts in psychology, one can scarcely fail to mention the para-psychology and extra-sensory perception experiments conducted over the past 30 years by Joseph B. Rhine and his associates at Duke University.[8] The results of experiments with the naming of unseen cards as they are dealt from a deck are reported to contain far more successful calls than could be expected on the basis of pure chance. The orthodox opinion at present appears to be that the effects are the result of too loose a system of laboratory controls, including the selection of favorable data and even unconscious erroneous recording by workers with a strong belief in extra-sensory perception.

12. *Allison.*—The final example of unorthodoxy which I shall discuss is the magneto-optic method[9] of chemical analysis proposed in 1930 by Fred Allison of Alabama Polytechnic Institute. Minima of light intensity were observed visually as a slider was moved along a set of parallel wires. The minima were said to be correlated with the chemical elements present. The method never gained general acceptance, since observers in other laboratories for the most part were either unable to obtain the minima or unable to correlate them with the elements in solution.

IV. Requirements for Acceptance

This survey of examples of unorthodoxy, I hope, has been of some interest and amusement. If it is to be instructive as well, we should examine critically the characteristics of those that have gained acceptance, in order to see whether they possess any common characteristics differing from those of the examples that have failed.

Experimental results must be reproducible without question in other laboratories and by other completely independent observers. In the examples given, the results of Galileo, Pasteur, and Millikan are now routinely repeated in university laboratory courses for instructional purposes. Failure in this respect was the most striking defect of the work of Blondlot, Ehrenhaft, Rupp, Rhine, and Allison.

All of the experimental results obtained under given conditions must be retained. The discarding of certain results without adequate independent cause gives the data a statistical bias which is seldom sufficiently appreciated.

Experimental results without any reasonable theory or explanation of mechanism may be quite valid, but one should be suspicious of such work. This lack was evident in the work of Blondlot, Ehrenhaft, Rhine, and Allison.

Where the work has been primarily the development of a theory, it must be consistent with all the known experimental facts. This may be called the requirement of absolute intellectual honesty. Copernicus, Galileo, Young, Pasteur, and Planck disregarded none of the available experimental information in formulating their theories.

In conclusion, I think that we should be prepared to scrutinize carefully new ideas and results with particular attention to the factors just mentioned. With the elimination of the unacceptable instances, we may well expect the accomplishment of significant scientific advances by those individuals who are willing to display unorthodoxy in science.

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Academy Seeks Closer Ties With Affiliated Societies

A dinner meeting was held on February 1, to explore means of developing closer relations between the Academy and its affiliated societies. Called by Archibald T. McPherson, 1960 chairman of the Policy and Planning Committee, the meeting was attended by some 17 representatives of the societies. Also present were WAS President Abelson and President-elect Van Evera, as well as Waldo Schmidt, Arnold Sookne, and Bourdon F. Scribner, members of the Policy and Planning Committee.

Four specific proposals for cooperative action were considered:

Preparation of a Joint Directory.—Response on the whole was favorable. While some representatives expressed disinterest, the majority favored a joint publication ranging from a listing of officers and functionaries to a directory of the entire membership.

Establishment of Headquarters.—The response to this proposal was varied. The smaller societies generally felt they had no need for a central office, but some would like to have mailing facilities provided. A general need was expressed for storage space for files.

Increasing Academy Membership.—As a group, the representatives felt that membership committees have not been sufficiently aggressive. It was suggested that the problem of recruitment is connected with that of increasing the prestige of the Academy. More publicity, particularly for the Academy's work with young people, and improved public relations are required, according to some representatives.

Promotion of Interdisciplinary Discussions and Meetings.—The representatives favored panel discussions on problems of national importance and involving several scientific disciplines, seminars of the type held by the New York Academy of Sciences, and the establishment of a list of speakers and subjects to assist affiliated societies in organizing interdisciplinary meetings.

The Policy and Planning Committee would welcome comments from the membership of the Academy on these specific proposals, as well as on other avenues of cooperation between the Academy and its affiliated societies.

WASHINGTON ACADEMY OF SCIENCES
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1962	WILLIAM G. BROMBACHER	National Bureau of Standards
1962	AUREL O. FOSTER	Department of Agriculture
1963	ALPHONSE F. FORZIATI	National Bureau of Standards
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(Roster not complete.)

Committee on Monographs *

DEAN B. COWIE (Chairman) ..... Department of Terrestrial Magnetism
* A one-man committee in 1961.

Committee on Awards for Scientific Achievement

(Chairman and committee members not yet appointed.)

Committee on Grants-in-Aid for Research *

ARCHIBALD T. MCPHERSON (Chairman) ..... National Bureau of Standards

* A one-man committee in 1961.

Committee on Policy and Planning

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1963	WAYNE C. HALL	Naval Research Laboratory

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Term through		
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1961	WILLIAM T. READ	
1961	HOWARD B. OWENS	Northwestern High School (Science Supervisor, Prince Georges County)
1962	ROY J. BARKER	Department of Agriculture
1963	LLOYD N. FERGUSON	Howard University
1963	ALFRED WEISSLER	National Institutes of Health

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1962	JOHN K. TAYLOR	National Bureau of Standards
1962	HOWARD A. MEYERHOFF	Scientific Manpower Commission
1963	LEO SCHUBERT	American University
1963	HERMAN BRANSON	Howard University

* The Committee constitutes half of the Joint Board on Science Education.

Special Committees

Committee on the National Zoo

CARLTON M. HERMAN (Chairman) ..... Patuxent Refuge, Laurel, Md.
KEITH C. JOHNSON ..... Science Supervisor, D. C. Public Schools
GEORGE W. WHARTON ..... University of Maryland

The Journal

Editor	SAMUEL B. DETWILER, JR.	Department of Agriculture
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	JOHN K. TAYLOR	National Bureau of Standards
Staff Assistant	RICHARD P. FARROW	National Canners Association

(For delegates of affiliated societies, see page 48)

MARCH MEETING

(456th Meeting of the Washington Academy of Sciences, Honoring the Washington Junior Academy of Sciences)

SUBJECT

Recent Significant Advances in Science

SPEAKERS

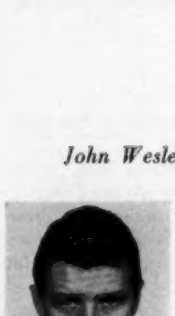
Biology: Christian B. Anfinsen, Jr., National Institutes of Health
Physics: Joseph Weber, University of Maryland

DATE

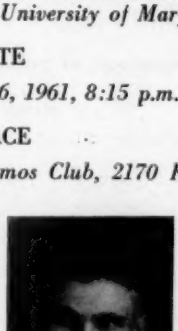
Thursday, March 16, 1961, 8:15 p.m.

PLACE

John Wesley Powell Auditorium, Cosmos Club, 2170 Florida Ave., N.W.



Christian B. Anfinsen, Jr., was born in Monessen, Pa. He received the A.B. degree from Swarthmore College in 1937, the M.S. degree from the University of Pennsylvania in 1939, and the Ph.D. degree in biochemistry from Harvard University in 1943. For most of the next seven years he served on the faculty of Harvard Medical School, as instructor or professor of biochemistry. In 1950, Dr. Anfinsen joined the National Heart Institute, NIH, as head of the group now known as the Laboratory of Cellular Physiology and Metabolism. His research studies have been particularly concerned with the synthesis and structure of proteins.



A native of Paterson, N.J., Joseph Weber was graduated from the U. S. Naval Academy in 1940, and served as a naval officer until 1948—first on active duty, and after 1945 with the Bureau of Ships in Washington. He began his association with the University of Maryland in 1948, as professor of electrical engineering. In 1951 he received the Ph.D. degree in physics from Catholic University. During 1955-56, Dr. Weber was a Guggenheim fellow at the Institute for Advanced Study, Princeton, and at the University of Leiden. He is currently professor of physics and electrical engineering at the University of Maryland.

PRESENTATION OF CERTIFICATES OF MERIT

At the general meeting, Academy President Philip H. Abelson will present certificates of merit to 21 high school students of the Metropolitan Area, for their achievements as winners or runners-up in the 1960 National Science Talent Search. These students are:

Thomas G. Andrews, Jr. (Bladensburg), Robert C. Bast, Jr. (Washington-Lee), Martha A. Burns (Immaculata), John M. Cone, Jr. (F. C. Hammond), Leland G. Dobbs (Sidwell Friends), Michael J. Finegan (Fairfax), Dennis W. Herrin (Ancostia), Edward C. Jones (Wakefield), Steven L. Jordan (Montgomery Blair), Margaret E. Kottke (Bladensburg), David H. Malin (Walter Johnson), Rosalie A. McCanner (Woodrow Wilson), David C. Mendelson (Western), Margaret A. Nelsen (Richard Montgomery), Michael C. Newlon (Western), Andrew R. Phelps (Sidwell Friends), Mary M. Shaw (Walter Johnson), Thomas M. Souders (McLean), Barry L. Sperling (McLean), Henry L. Vacher (Western), Robert L. Waymost (Bethesda-CC).

Prior to the general meeting, the students and their science teachers will be guests at a dinner sponsored by the Committee on Encouragement of Science Talent, to be held at the Fairfax Hotel, 2100 Massachusetts Ave., at 6:30 p.m. All members of the Academy who are interested in encouraging science talent are invited to attend.

Science in Washington

SCIENTISTS IN THE NEWS

This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors have been assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, care of Agricultural Marketing Service, U. S. Department of Agriculture, Rm. 3917 South Bldg., Washington 25, D. C.

APPLIED PHYSICS LABORATORY

Ralph E. Gibson, director of the Applied Physics Laboratory, was general chairman of the 14th Annual Conference on the Administration of Research at Ann Arbor, September 18-21, 1960. Dr. Gibson also spoke on September 13 at Williamsburg, Va., at the Brookings Institution Conference for Federal Science Executives; his topic was "Science, Technology and Economic Growth."

Albert M. Stone, technical assistant to the director, also attended the 14th Annual Conference on the Administration of Research.

GEOLOGICAL SURVEY

Alfred M. Pommer attended conferences on radioactive waste disposal in Denver, January 9-11.

NAVAL RESEARCH LABORATORY

George T. Rado, head of the Magnetism Branch, presented an invited reportorial talk at the Sixth Conference on Magnetism and Magnetic Materials, November 14-17, 1960, in New York City. His lecture provided an integrated summary of 16 experimental and theoretical papers on ferromagnetic resonance, and constituted the first use of the reportorial system at these Conferences. Under this system, a single talk replaces individual presentations of several papers.

NATIONAL BUREAU OF STANDARDS

Arnold M. Bass is on a research assignment in London under the NBS training program. He is working with W. R. S. Gaston in the Physics Department, Imperial College of Science and Technology, University of London. Dr. Bass is expected to return in July.

USDA, BELTSVILLE

Flippo Gravatt, while on a vacation in Puerto Rico recently, conferred with university and other authorities on the preservation of "Bahia Fosforescente," a world-famous bay displaying luminescence every night of the year. Mr. Gravatt is the Maryland and District of Columbia representative of Nature Conservancy, a national organization. This organization has purchased the famous "Battle Creek Cypress Swamp" and a hemlock forest in southern Maryland and a part of the Crainesville tamarack swamp west of Oakland, Md. Suggestions about other natural areas needing preservation will be appreciated.

James E. McMurtrey, Jr., was awarded a certificate in recognition of his accomplishments and contributions to the promotion of tobacco research at the 17th Tobacco Workers Conference on January 17. He has been associated with these conferences for 45 years. Mr. McMurtrey was one of ten oustanding scientists to be elected to an honorary lifetime membership in the Soil and Crop Science Society of Florida, at its 20th annual meeting on November 29, 1960.

USDA, WASHINGTON

Samuel B. Detwiler, Jr., Agricultural Research Service, spent November and part of December in India, as a member of a team which negotiated grants for agricultural research with scientific institutions, under the provisions of U. S. Public Law 480 (83rd Congress). His travels took him to New Delhi, Bombay, Madras, Bangalore, Mysore, Poona, Allahabad, and other cities. On leaving India, Mr. Detwiler visited institutions in Karachi, Pakistan, and the Rome office of the ARS foreign grants program.

Kenneth W. Parker presented an invited paper, "What's Ahead in Range Research?" at the 14th Annual Meeting of the American Society of Range Management, held at Salt Lake City January 31-February 3.

Benjamin Schwartz gave the fall-term biological lecture at the University of Illinois at Urbana, December 1, 1960, on "The Evolution of Knowledge Concerning *Ascaris lumbricoides*." On January 12, he gave an illustrated lecture at USDA on "Trichinosis and Its Control—A Century of Progress."

For the past few months Dr. Schwartz has served as consultant parasitologist to the Meat Inspection Division.

UNCLASSIFIED

Victor Hicks has been appointed staff scientist of the Military Department of Remington Rand Univac. He was formerly manager of the physics laboratory of Allen Bradley Company. Dr. Hicks holds the rank of rear admiral in the U. S. Naval Reserve.

AFFILIATED SOCIETIES

In a number of instances, information on the specific program scheduled for meetings of affiliated societies is not available sufficiently in advance to be included in the Calendar of Events. Where possible, therefore, this material will be carried as a news event in the next issue of the Journal in the commentary concerning the society in question.

Acoustical Society of America, Washington Chapter

On February 20, Alfred Weissler spoke to the chapter on "Ultrasonic Cavitation as a Cause of Chemical Change."

American Institute of Electrical Engineers, Washington Section

Howard Mitchell, conductor of the National Symphony, discussed on February 14 some of the technical problems involved, from the artist's viewpoint, in the production of live and recorded orchestral music.

The first Precision Measurement and Standards Meeting, held February 21 in cooperation with several related professional groups, presented J. Cameron and A. G. McNish, of NBS, on "Propagation of Error in a Chain of Standards."

The Transportation, Industry, and Management Division on February 13 heard Lowell H. Hattery, American University, speak on "Computers and Management." A meeting scheduled for March will consider "Basic Concepts of Sound System Applications."

In the Power Division, chairmen and secretaries of the four technical groups concerned have been selected. A general discussion was held on January 24 to consider future plans and programs.

Two technical discussions have been conducted by the Science and Electronics Division—one on "Thermoelectricity" by William Lucke of the Naval Research Laboratory, and another in the area of computers.

American Society of Civil Engineers, National Capital Section

Robert Z. Page, Bureau of Yards and Docks, pointed out in a talk on "Some Contributions of Biological Sciences to Engineering" that activities of various living organisms not infrequently complicate and frustrate the efforts of the civil engineers, and supported his thesis with two recently prepared films. In addition, the recipient of the student fall award, Michael A. Czachor of Catholic University, gave a brief paper on "Hyperbolic Paraboloids in Construction."

Student chapter meetings were held at Georgetown University on February 2 and at Howard University on February 14 and 28.

American Society of Mechanical Engineers, Washington Section

The jointly sponsored lecture on "Propagation of Error," noted above, was originated by the George Washington University Center for Measurement Science, newly established in collaboration with the Bureau of Standards and with financial support from the Martin Company of Baltimore. The Center serves to train personnel in measurement techniques and to conduct research on measurement problems, and as a service organization. An Associates Program, comprising individuals, governmental and non-governmental agencies contributing support to the Center, provides the necessary linkage with industry and other consumers.

The February 23 meeting included an address by James Dickson, Allis Chalmers Company, on "Ingredients Required in Building a Nuclear Power Reactor."

Current interest in science and engineering education suggests that additional comment on Paul F. Chenea's December talk would be appropriate. On this occasion he pointed out the need for a curriculum that recognizes the trend to research in industry, and that more and more engineering problems cut across two or more of the traditional enginering specialties. Industry increasingly regards very large expenditures for computers as valid in replacing engineers themselves, particularly when it means dramatic reductions in design lead time. Publicity given to what he called "scientific successes" and "engineering failures" is steering certain students from engineering into science, a movement heightened by changes in the high school physics course itself. Dr. Chenea felt that the professional content of the undergraduate curriculum was under deep scrutiny, that almost none of the modern instrumentation was to be found at the undergraduate level, that engineering education beyond the B.S. degree was increasingly in demand, and that attention must be given to upgrading of faculty competence.

Botanical Society of Washington

At its most recent meeting, the Society heard Louis B. Baron, Walter Reed Army Institute of Research, on "Sexual Behavior and Mechanisms in Bacteria." Dr. Baron was the recipient of this year's Academy award in the biological sciences.

Chemical Society of Washington

At a Board of Managers meeting on January 12, supplementing the meeting of January 10, two new special committees were established: a committee on tellers, which would be active during the nomination and election of officers, and a committee on long range planning, which would comprise all councilors in the area including national Division councilors, and would serve in an advisory capacity to the Board.

Future Board meetings will be held on special call, rather than prior to general meetings of the Society, as in the past. Each general meeting will, however, be preceded by a dinner open to all members.

The formation of topical groups within the Society will be discussed at future Board meetings.

At the Society's general meeting on January 12, Allen L. Alexander, retiring president, spoke on "Recent Research in Functional Organic Coatings." At the general meeting on February 9, held jointly with the Washington Junior Academy of Sciences, John Turkevich of Princeton University spoke on "The World of Fine Particles."

Entomological Society of Washington

Roman Vishniac, of the Living Biology Film Series, spoke at the January meeting and showed motion pictures of insects and other animals in their natural habitats.

In a related area, it might be noted that Colin G. Butler of the Rothamsted Experimental Station, England, visited the University of Maryland early in January and lectured on "Interattraction among Members of a Honeybee Community." Dr. Butler, who is in this country under the AIBS Foreign Visitors Program, is well known for his discovery of the so-called "queen substance."

Geological Society of Washington

Three papers were given at the January 25 meeting, as follows: John C. Goodlett, "Plant Distribution and Pollen Analysis"; Thor H. Kiilsgaard, "Ore Deposits of Southern Peru"; and W. H. Bradley, "Geochemical Balances in the Green River Formation of Wyoming."

On February 8, R. E. Wallace, N. J. Silberling, and D. B. Tatlock discussed "Some Structural Features of the Humboldt Range, Nevada"; W. T. Pecora spoke on "Origin of Carbonatites, Bearpaw Mountains, Montana"; and L. C. Pakiser, Jr., D. P. Hill, and H. L. Baldwin considered "Gravity Anomalies in Volcanic Regions of the Southern Cascade Range, the Snake River Plain, and Yellowstone National Park."

Helminthological Society of Washington

The 377th meeting was held jointly with the Howard University Chapter of Sigma Xi on February 17, at which time five members of the Department of Zoology presented papers. Neville K. Rajapaksa reported on the reproductive capacity of *Argas persicus* after starvation; and D. R. Lincicome, Jacqueline A. Shepperson, E. H. Francis, and Anna L. Cherrie gave data on various aspects of *Trypanosoma* in experimental animals.

Insecticide Society of Washington

On February 15, Price G. Piquett, USDA, spoke on "Chemical Inhibition of Gonadal Development in Insects," and Martin Jacobson, also of USDA, on "What is Known about Juvenile Hormones."

Institute of Radio Engineers, Washington Section

At the Section meeting on February 13, William C. Coombs, National Bureau of Standards, showed how, in "Digital Television," a way is opened to encoding techniques which are in line with modern communications theory, and demonstrated methods for achieving fidelity in the picture without undue expansion of the band width. Nonclassified aspects of recent Government television developments were made available.

Advance notice has appeared of the Second National Symposium on Human Factors in Electronics, scheduled for May 4 and 5 at the Marriott-Twin Bridges Motor Hotel in Arlington. This Symposium is sponsored by the national Professional Group in this area of concern.

Professional Group Chapter activities include programs on "TEM Diode Switching," February 7; "The Psychology of Selling Ideas to Management," January 30; and "The Determination of the Thermocynamic and Electrodynamic Constants of the Surface of the Moon," February 21.

International Association for Dental Research, Washington Section

On February 20, Meyer Rubin of the Geological Survey addressed the Section on "C^{14} Dating and the New Frontier," and in so doing showed how low-level counts have become increasingly difficult as all materials become radioactively contaminated, with comments on techniques developed to overcome these difficulties. In another paper, Comdr. G. H. Rovelstad, Naval Dental School, spoke on "Salivary Corpuscles"—leucocytes recently shown to be present in the oral cavity in large numbers.

Medical Society of the District of Columbia

Space limitations completely rule out its reproduction here, but Washington scientists should be aware of the monthly publication, by the Medical Society, of a *Current Medical Events* leaflet. The February issue lists more than 40 events of medical interest, the great majority of which are open to interested individuals without restriction.

Philosophical Society of Washington

The 1503rd meeting of the Society, January 27, presented R. V. Pound, of Harvard University, in a paper on "Laboratory Measurements of the Gravitational Red Shift."

Society for Experimental Biology and Medicine, District of Columbia Section

On February 2 a joint meeting was held with the Md-Va-DC Chapter of the American Association of Clinical Chemists. A series of four papers was arranged: Robert Scow, NIH, "Fat Metabolism in Experimental Diabetes"; Edward C. Knoblock, Walter Reed, "Cholesterol and Lipoproteins Following Radiation Injury"; Abel M. Domiguez, Armed Forces Institute of Pathology, "Biochemical Approach to Determination of Antemortem Hypoxia"; and James Field, NIH, "In Vitro Stimulation of Glucose Oxidation in Thyroid by Thyroid Stimulating Hormone."

The Section, as have several affiliated societies, reports approval by its members of a contribution to the work of the Joint Board on Science Education.

Society of American Military Engineers, Washington Post

On February 20, the Post scheduled a talk by Harry Lowe, Jr. on "Extra Terrestrial Construction."

CALENDAR OF EVENTS

Events which, so far as we can determine at the time of writing, will take place subsequent to the appearance of the ***Journal*** *are noted below. Where possible, the nature of the program is indicated; in most instances the entry merely notes the date and place of a regularly-scheduled meeting of the organization in question. Last-minute changes in time and place, or emergency cancellations, may in certain instances alter the situation.*

March 6—American Institute of Electrical Engineers, Washington Section

Telemetry and Instrumentation Division (postponed from December)—Robert Hart, Barth Engineering and Manufacturing Company, "Dynamic Simulation of Telemetry Signals."

PEPCO Auditorium, 8:00 p.m.

March 7—American Institute of Electrical Engineers, Washington Section

Student Night meeting, originally scheduled for March 14. Dinner meeting at Catholic University, followed by a play staged by the Catholic University Speech and Drama Department.

March 7—Botanical Society of Washington

Meets with staff members of the Smithsonian for a presentation of the research program in plant science at that institution.

March 8—American Society of Mechanical Engineers, Washington Section

Third Annual Banquet, Terrace Banquet Room, Shoreham Hotel. Speaker will be John H. Rubel, Office of the Secretary of Defense, "Rising Costs of Research and Development."

March 8—Geological Society of Washington

John Wesley Powell Auditorium, 8:00 p.m.

March 9—Chemical Society of Washington

Annual Hillebrand Award dinner and lecture. Guest of honor: Frank T. McClure, Applied Physics Laboratory. Tickets: $3.50.

National Housing Center, 1625 L St., N.W., 7:30 p.m.

March 10—Philosophical Society of Washington

John Wesley Powell Auditorium, 8:15 p.m.

March 13—American Society for Metals, Washington Chapter

Dwight Brown, Jones and Laughlin Steel Company, "Direct Reduction of Iron Ore."

AAUW Headquarters, 2410 Virginia Ave., N.W.

March 14—Institute of Radio Engineers, Washington Section

Professional Group on Microwave Theory and Technology.

March 15—American Society of Civil Engineers, National Capital Section

Annual Dinner, Shoreham Hotel. Cocktails, 6:00; dinner, 6:45; program, 8:00 p.m. National President Glen Holcomb will present life memberships to 12 members.

March 15—Insecticide Society of Washington

Symons Hall, University of Maryland, 8:00 p.m.

March 15—Washington Society of Engineers

John Wesley Powell Auditorium, 8:00 p.m.

MARCH 16—WASHINGTON ACADEMY OF SCIENCES

March 16—Society of American Foresters, Washington Section

YWCA, 6:30 p.m.

March 17—Institute of Radio Engineers, Washington Section

Arthur G. Norris, Vitro Engineering, "The Peaceful Do-existence of Engineers and Writers."

U. S. National Museum, 8:00 p.m.

March 20—Acoustical Society of America, Washington Chapter

Gallaudet College, 8:00 p.m.

March 20—Society of American Military Engineers, Washington Post

YWCA, 17th and K Sts., N.W., noon.

March 21—Anthropological Society of Washington

Richard Jessor, University of Colorado, "A Social Learning Approach to Culture and Behavior."

U. S. National Museum, Room 43, 8:15 p.m.

March 21—Institute of Radio Engineers, Washington Section

Joint meeting of professional groups on Instrumentation and on Space Electronics and Telemetry.

March 22—Geological Society of Washington

John Wesley Powell Auditorium, 8:00 p.m.

March 23—American Society of Mechanical Engineers, Washington Section

General meeting, elections.

PEPCO Auditorium, 8:00 p.m.

March 23—Institute of Radio Engineers, Washington Section

Professional Group on Antennas and Propagation.

March 24—Philosophical Society of Washington

John Wesley Powell Auditorium, 8:15 p.m.

March 28—American Society of Civil Engineers, National Capital Section

Luncheon meeting, YWCA, 17th and K Sts., N.W., noon.

March 28—Society of American Bacteriologists, Washington Branch

A. C. Sanders, M. J. Pelczar, Jr., and Susan Chapman, Walter Reed Army Institute of Research and University of Maryland, "The Synergistic Role of *Staphylococcus* in 'penicillin-resistant' gonorrhea"; and H. E. Hopps, J. L. Showacre, and J. E. Smadel, NIH, "Intracellular Infection of Tissue Culture Cells with *Salmonella typhosa*."

Sternberg Auditorium, Walter Reed Army Institute Center, 8:00 p.m.

March 30—Society for Experimental Biology and Medicine, District of Columbia Section

Gorman Auditorium, Georgetown University Medical Center, 8:00 p.m.

ACADEMY ACTIVITIES

JANUARY BOARD MEETING

The following notes are for the timely information of the membership; they are not the official minutes of the meeting.—Ed.

The Board of Managers held its 534th meeting on January 17 at NBS, with President Wood presiding. The following were present: William G. Allen, Carl I. Aslakson, Gerhard M. Brauer, William G. Brombacher, Samuel B. Detwiler, Jr., Aurel O. Foster, Francois N. Frenkiel, Wayne C. Hall, Regina F. Herzfeld, Keith C. Johnson, Mary L. Fell, Kathryn Knowlton, Archibald T. McPherson, Howard S. Rappleye, Harald A. Rehder, Raymond J. Seeger, Doys A. Shorb, Heinz Specht, Jack C. Thompson, Benjamin D. Van Evera, and Lawrence A. Wood.

Dr. Wood spoke briefly of his appreciation for the work of the Board during 1960, then asked for the annual reports of standing committees.

In the absence of Dr. Stiehler, the report of the Meetings Committee was presented by Dr. Wood. (See abstract of report elsewhere in this issue.) The report was accepted.

Dr. Hall presented the report of the Membership Committee. (See abstract of report elsewhere in this issue.) The report was accepted.

Dr. Hall also gave the first reading of eight nominees for membership.

Dr. Wood referred the Board to the final report of the Awards Committee presented at the meeting of December 20. (See December meeting notes in the February *Journal*, page 24, also the story, "Academy Presents Awards to Six," on page 11 of the same issue.)

Dr. McPherson presented the report of the Policy and Planning Committee. (See abstract of report elsewhere in this issue.) The report was accepted.

Because of the illness of Dr. Schubert, Dr. Wood presented the report of the Committee on Encouragement of Science Talent. (See abstract of report elsewhere in this issue.) The report was accepted.

Dr. Van Evera presented the report of the Committee on Grants-in-Aid for Research. (See abstract of report elsewhere in this issue.) The report was accepted.

In the absence of Dr. Seeger, Dr. Wood pointed out that a report of the Committee on Science Education concerning Joint Board activities, prepared in July 1960 by John K. Taylor, had previously been distributed. (The Committee and the Joint Board are appointed for the fiscal year beginning July 1.) The report was accepted.

Mr. Johnson commended the Committee on Science Education and the Joint Board for their help to the metropolitan area schools. Dr. McPherson pointed out that the Washington Academy leads all the academies of the United States in improvement of science education.

Following the second reading of their names by Dr. Hall, 22 persons were elected to membership in the Academy, as follows: Wendell L. Anderson, Mortimer C. Bloom, Carl R. Brewer, James W. Butler, Homer W. Carhart, James M. Cassel, Irvin L. Cooter, Jules R. de Launay, Joachim B. Ehrman, Richard P. Farrow, Robert G. Glasser, Harry D. Holmgren, Billy M. Horton, Charles H. Klute, Paul E. Landis, Helen D. Park, Maynard J. Pro, Edward J. Schremp, Max Tryon, John P. Vinti, Walter W. Wada, and Carl H. Walther.

Dr. Specht submitted the secretary's annual report, which was accepted. (See February *Journal*, page 19.)

Captain Aslakson submitted the treasurer's annual report, which was accepted. (See abstract in February *Journal*, page 18.)

Speaking for the *Journal*, Mr. Detwiler commented that the 1960 volume constitutes its own report of accomplishment. He pointed out that the quality of any issue of the *Journal* and its cost are closely linked together. Also, he noted that he is attempting to get each issue into the mails in advance of the Academy meeting, in order that it may be used as an encouragement to the members—by way of a monthly meeting page—to attend the meetings.

Dr. Seeger having arrived at the meeting, he discussed the situation of the Committee on Science Education and the operation of the Joint

Board. He pointed out that the Board had turned into an operating group rather than a sponsoring and directing group, and that this could not continue. He announced that a Committee had been set up to inquire into proper activities for the Joint Board on a long-rang basis.

Dr. Wood then addressed himself to the Board as retiring president. (See his remarks in the February *Journal*, page 9.) He expressed appreciation of the fine work of committee chairmen and appointees, and the cooperation of all involved in the Academy's administration.

ABSTRACTS OF ANNUAL REPORTS OF STANDING COMMITTEES

Committee on Meetings

The Committee met twice during the year and arranged eight meetings, all held in the John Wesley Powell Auditorium at 2170 Florida Avenue. The 447th meeting was held on February 18, 1960; the 448th, on March 17; the 449th, on April 21; the 450th, on May 19; the 451st, on October 20; the 452nd, on November 17; the 453rd, on December 15; and the 454th, on January 19, 1961. (For names of speakers and their topics, see secretary's annual report in February *Journal*, page 19.)

The attendance at meetings ranged from a low of 15 at the meeting of December 15 to about 200 at the jointly-sponsored meeting of November 17. The meeting of October 20 had an attendance of over 130, and was the largest of those sponsored solely by the Academy.

The weather and lack of notices to members contributed to the low attendance at the 453rd meeting. Nevertheless, the 449th and 450th meetings also were poorly attended, with less than 50 persons present. On the other hand, the enthusiastic reception of the jointly-sponsored meetings indicates that more meetings of this type should be held.

The local section of the American Meteorological Society was not in a position to co-sponsor the meeting of December 15. However, the section would like to hold a joint meeting with the Academy during 1961, since the last joint meeting was over five years ago.

Committee on Membership

This was the second full year of operation under a system whereby each Committee member except the chairman served on a panel of six scientists (members of the Academy) which reviewed nominations to the Academy of individuals active in particular areas of science. Under this procedure, nominations were routed by the general chairman to the proper panel chairman for action of the panel. Generally, nominations were mailed from member to member within the panels. Then, on the first Wednesday evening of each month, the Membership Committee proper met to discuss its work and complete action on the nominations which had been reviewed by the panels. The system seemed to work quite satisfactorily, although it seemed to be a bit slow in overall response. Of the 100 nominations handled by the Committee in 1960, 83 were elected to the Academy; 5 are still within the Committee; 3 were rejected; 1 was referred to the Board of Managers for action; and 8 were to be submitted to the Board for first reading on January 17. For comparison with the previous year, between 15 and 20 percent more nominations were reviewed by this Committee than by the previous one.

There are several matters which may need to be considered by future Membership Committees. For example, under the present setup involving panels, there is no specific provision for handling nominations of scientists who are primarily in administrative posts, or teaching posts. Therefore, such nominees must be considered by the Membership Committee itself. This situation has not led to any particular difficulties, since the candidates with these qualifications have been few in number. No change in the present setup is recommended.

Another and more important matter has to do with the action to be taken on certain recommendations of the Awards Committee. The last two chairmen of that Committee have submitted reports in which selected, unsuccessful nominees for awards were recommended for membership. Since the examination by the Awards Committee of the qualifications of a candidate is more than adequate to assess these qualifications, it is not believed necessary for the Membership Committee to subject these candidates to further examination and review . . . It is recommended that in future, when the Awards Committee makes positive recommendations for the election of suitable candidates, the following procedure should be observed: The Awards Committee should submit to the Board of Managers, with copies to the Membership Committee, one-paragraph statements regarding the qualifications and other pertinent information concerning the candidates, together with the statement that the Awards Committee members are the sponsors for the nominations; the respective citations should also be included. Then the action to be taken by the Membership Committee need be only to determine whether the nominee actually desires election. When this information has been obtained, it can be forwarded to the Board of Managers, together with the recommendation of the Membership Committee. In the case of those candidates who desire election to the Academy, the action of the Membership Committee would be expected to endorse that of the Awards Committee, or give reasons for a different view.

Policy and Planning Committee

The Committee reviewed a new draft of the Standing Rules of the Academy and recommended to the Board that they be adopted, with minor revisions.

The Committee considered a proposal to establish a new Academy award in the earth sciences or earth and space sciences. It recommended that such an award not be established, but instead, that two awards be given in any of the present fields in which there are unusually well-qualified candidates.

The major activity of the Committee is unfinished. This concerns the promotion of closer relations between the affiliated societies and the Academy, in order that the Academy may be of greater service to the individual societies, their membership, and the scientific community of Washington. To further these objectives, a dinner conference has been planned to be held at the Cosmos Club on February 1, at which the following topics will be discussed: (1) Preparation of a joint directory similar to the 1947 directory; (2) a look ahead toward the establishment of a central headquarters for the Academy and the larger affiliated societies; (3) increase in Academy membership; and (4) promotion of interdisciplinary discussions and meetings. (See report of this meeting, elsewhere in the present issue.)

Committee on Encouragement of Science Talent

The Committee was very active in 1960, particularly as concerns its work with the Washington Junior Academy of Sciences. In this field, several categories might be considered:

(a) Monthly meetings were held by the WJAS Governing Council, in which Committee members participate. These meetings were, on the whole, well attended and considerable business was transacted.

(b) The Committee and WJAS again were prime movers in local science fairs. The science fairs this year were larger than any in the past; WJAS contributed $1,000 to their support.

(c) The Committee acted in behalf of the Science Talent Search; in particular, local winners were selected and honored for outstanding scholarship at a joint meeting of WJAS and the senior Academy on March 17.

(d) The Committee helped organize the science trips to Philadelphia last fall. A total of 3,714 students participated in the five trips that were arranged; over $2,500 was realized by this project.

(e) The system of area councilors, devised in 1959, worked very well in 1960. Each of the areas had an active representative.

(f) Much work has gone into new selection procedures for membership in WJAS. Some of us have been disturbed that election to WJAS was based only on science fair competition. The new procedure makes it possible for others, such as those who are active in school science clubs, to be elected.

(g) A special meeting of all science club presidents in the area was held on December 17. Over 125 people attended, including science club presidents, WJAS members, scientists, and educators. It is hoped that this will augur well for increased liaison between WJAS and science clubs of the individual schools, and for strengthening the science club movement.

(h) The Committee and WJAS sponsored the second Science Conference, held December 29 at an all-day session in the Ambassador Hotel. Some 25 papers were read by students in divided meetings. The Conference was an unqualified success.

The Committee sponsored an interesting summer research program. In this program, 15 selected students were given the opportunity to work without remuneration at the National Institutes of Health; they were given $10 a week to meet their expenses. Based on this experience, the Committee has proposed to the National Science Foundation that it finance a similar program for the summer of 1961.

Committee on Grants-in-Aid for Research

In 1960, as in 1959, there was a minimum of activity by this Committee. Three applications for funds were received, of which two were recommended by the Committee and granted by the Board.

John Budlong of McLean High School received a grant of $50.00 to aid in an experiment on determining the velocity of light. On his own, Budlong had made arrangements to use facilities of the telephone company, including the roof of its building and one of its towers for reflection purposes. After Budlong had purchased the parts for the equipment he needed and had it all calibrated, vandals destroyed a good part of it. In the time that remained, using his salvaged equipment, he switched the experiment to one on the velocity of sound, in which he did an exceedingly good piece of work. He was awarded a first place in the Northern Virginia Science Fair; because he had already spent an excessive amount of time on the project, he did not compete in other fairs.

Michael Finnegan received a grant of $55.80 for chemicals to be used in a study of chromic acid oxidation through the synthesis of o-nitro acetophenone from o-ethyl nitrobenzene.

William Burchaell of Fairfax, who received a grant of $92.00 at the end of 1959 to buy supplies for a chromatographic study of amino acids in the thyroid, reports that he entered his project in five science competitions and received the following awards:

(1) Second place in senior biochemistry, Fairfax High School Science Fair.

(2) First place in 11th grade chemistry, Northern Virginia Science Fair.

(3) First place in chemistry, University of Virginia Science Open House (award by Society of the Sigma Xi).

(4) Second place ($50 award), Randolph Macon Science Competition. (Judging was on an overall basis, with no categories for age, grade, or field of project.)

(5) First place in chemistry ($50 award),

Virginia State Science Fair, sponsored by the Virginia Junior Academy of Science.

The recommendations of last year's Committee are repeated here: (1) The Committee should consist of a single individual; (2) each grant request should be referred to a scientist competent in the subject field, who would interview the student to determine the value and feasibility of the proposal; (3) it should be emphasized that the purpose of the grants is to assist students in their research, not primarily to help them prepare for a science fair project; (4) any project should involve some research; (5) the funds should be for the parts out of which equipment can be made, rather than the equipment itself; (6) as an aid to the Committee chairman, the directory of the Washington Academy should list the field of interest of each member.

JOINT BOARD ON SCIENCE EDUCATION

The annual Engineers, Scientists, and Architects Day Luncheon held at the Presidential Arms in Washington on Thursday, February 23, was the occasion for the presentation of Distinguished Teacher Awards to 12 local elementary, junior high, and senior high school teachers. In addition, 52 other teachers received citations for outstanding teaching of science and mathematics.

Engineers, Scientists, and Architects Day was established several years ago to honor and call public attention to the contributions of these professions to human progress. Because of the prime importance of good teaching to technologic advancement, it seemed proper to use this occasion to honor outstanding teachers. Accordingly, the Joint Board on Science Education in 1958 established the Distinguished Teacher Awards. From nominations submitted by the school principals, 12 are selected for the Award. An unspecified number of the nominees are selected on the basis of very meritorious commendation to receive a citation.

The Award consists of an engrossed certificate and personalized copies of the Smithsonian Treasury of Science, as well as the *Scientific American* Science Project Book. The others receive certificates of citation. All are honored guests of the Joint Board at the ES&A Day luncheon.

Distinguished Teaching Awards were presented to: Helen B. Arni, Westlawn Elementary School (Fairfax); Ruth H. Bauer, Northwestern H. S. (Prince Georges); Sister Mary Blanch, Immaculata H. S. (D.C.); Thomas H. Christie, Washington-Lee H. S. (Arlington); Lucille T. Freeman, Monroe Elementary School (D.C.); Dale E. Gerster, Bladensburg H. S. (Prince Georges).

Also, George A. K. Jones, Glasgow Intermediate School (Fairfax); Alfred C. Rogan, Northwood H. S. (Montgomery); Ephraim G. Salins, Springbrook H. S. (Montgomery); Grace H. Smith, LaSalle Laboratory School (D.C.); John M. Winters, Sherwood Jr.-Sr. H. S. (Montgomery); Robert L. Wistort, High Point H. S. (Prince Georges).

Certificates of citation were presented to the following:

From the District of Columbia—Josephine A. Berkey, Kramer Jr. H. S.; Carolynne G. Branson, Terrell Jr. H. S.; Mrs. Howland M. Caple, Shodd Elementary; Rev. John A. Coughlan, Archbishop Carroll H. S.; Louise A. Dickson, Anacostia H. S.; Edna K. Dodge, Hearst Elementary; Betty B. Francisco, Brightwood Elementary; Hilda Jecklin, Calvin Coolidge H. S.; Grace E. McDowell, Garnet-Patterson Jr. H. S.; Jean McGregor, McKinley H. S.; Bessie Pinner, Shaw Jr. H. S.; Annie T. Reid, Hine Jr. H. S.; Rev Floyd Schulze, Mackin H. S.; Mrs Hollie C. Tillinghast, Miller Jr. H. S.; Virginia E. Tyler, Lafayette Elementary; Opal D. Weida, Ballon H. S.; Judith S. Wescott, Macfarland Jr. H S.; Howard S. White, Taft Jr. H. S.; Jane K. White, Janney Elementary.

From Arlington County—Felix Blackwood, Jr., Hoffman-Boston H. S.; Donald Buttermore, Gunston Jr. H. S.; Patricia J. Custer, Jefferson Jr. H. S.; Ione B. Surrett, Williamsburg Jr. H. S.; Simeon Taylor III, Yorktown H. S.; Walter Taylor, Hoffman-Boston H. S.; Cornelius Van Scott, Nottingham Elementary; Gilmer Weatherly, Wakefield H. S.

From Fairfax County—Sadie Bruin, Herndon Elementary; Deloris G. Evans, James Lee Elementary; Emmett A. Hutcheson, Jr., Glasgow Intermediate; Marie Jones, Belvedere Elementary; Russell G. Kerlin, Jr., Longfellow Intermediate; Mary M. Moore, Crestwood Elementary; Herbert P. Rice, J. E. B. Stuart H. S.; Mary W. Stine, Groveton H. S.

From the city of Falls Church—Dorothy Moore, Jefferson Elementary.

From Charles County—W. Edward Lakes, La Plata Jr. H. S.

From Montgomery County—Charles C. Amtower, Newport Jr. H. S.; Mrs. Adnah J. Berthright, Takoma Park Jr. H. S.; Mrs. Francis R. Borders, Wyngate Elementary; Martha H. Green, Rock Terrace Elementary; Patricia L. Johnson, Belt Jr. H. S.; Agnes M. Nachman, Kensington Jr. H. S.

From Prince Georges County—Barbara Anne Creegan, West Lanham Hills Elementary; Elizabeth Erling, Glenridge Jr. H. S.; Joyce Harris, Adelphi Elementary; Clifford Hersey, Surrattsville H. S.; Barrett L. McKown, Suitland H. S.; James M. Skidmore, Laurel Jr. H. S.; Frances Wells, District Heights Elementary.

THE BROWNSTONE TOWER

On October 26, 1951, I had occasion to visit the laboratories of the Arthur D. Little Company in Cambridge, Mass. While there I was taken to the roof of the building to see an unusual pilot plant for the continuous production under sunlight of large quantities of a microscopic, unicellular alga of the genus *Chlorella*. The Company's purpose was to determine the feasibility of growing Chlorella economically for use as a food or food supplement for man or animals. Theoretically, the Chlorella farmer would need only a recirculating system for an aqueous, carbon-dioxide-enriched, nutrient medium that would permit optimum growth and reproduction of these cells under sunlight. And he would need means of maintaining the desired concentration of the medium while continuously harvesting cells uncontaminated by other microorganisms. Then he would centrifuge or filter and dry the cells and market the resulting dry green powder. Or the chlorophyll could be extracted and the dry powder marketed without it. One could easily imagine an automatic process in which nutrient materials and carbon dioxide would be added at one point and dry Chlorella powder would be bagged for shipment at another. I really though Chlorella was "in the bag" at that time. To be sure, it tasted like grass to me, but I supposed it would be a simple matter to disguise or mask its disagreeable flavor, especially if it were used as a food supplement.

On February 6, 1961, almost ten years later, I learned that Chlorella is not ready for commercial production. My informant is one of the brilliant younger investigators in the Washington area—Robert W. Krauss, professor of plant physiology at the University of Maryland and a member of the Washington Academy of Sciences. I visited him in his office on the third floor of H. J. Patterson Hall, toured his laboratories, and had lunch with him and his colleague, R. A. Galloway, at the University's Faculty Club. I did not see his research associate, Constantine Sorokin, but observed his work on a strain of Chlorella that grows best at 39° C.

Bob Krauss has been working on the physiology of algae since he was a predoctoral student at the University of Maryland in 1949-51. He came to the University to study with Hugh G. Gauch, and he himself proposed to Professor Gauch that he investigate the inorganic nutrition of algae, not because of its practical value, for he was not then aware of it, but because the subject excited his curiosity. Dr. Gauch and Ronald Bamford, chairman of the Department of Botany and dean of Maryland's Graduate School, approved Bob's project and helped him procure what he needed to do the work. In the last ten years he has become an authority on his subject, and his laboratory is recognized as one of the leading centers of study in this field.

Bob became aware of the possibilities of Chlorella farming while he was still a graduate student. He told me that during World War II, H. A. Spoehr and H. W. Milner, of the Carnegie Institution's Department of Plant Biology at Palo Alto, Calif., had looked for antibiotics in algae without much success but had found something else that seemed to have practical possibilities; namely, the fact that the chemical composition of the cells was subject to wide variation depending on the composition of the medium. Thus one could at will produce cells high in protein, fat, or carbohydrate. Vannevar Bush, then director of the Carnegie Institution, saw possibilities of producing needed food substances in a new and efficient manner. Bob Krauss was already studying factors affecting the mass culture of certain algae and, remaining at the University of Maryland, he became a research fellow of the Carnegie Institution, which, together with the Office of Naval Research, supported his research for several years. But Bob never allowed himself to be diverted from basic research to the development of the production of algae for food. He felt that there was much to learn about the physiology of these algae before engineering research could be intelligently applied to them, and he believes that is still true today. Chlorella is not yet "in the bag," but the need for it as food in some parts of the world may be so great that one would expect persistent experimentation on its commercial production by government or industry or both. Something is being done in Japan by H. Tamiya and his assistants. Some, like A. T. McPherson, past president of our Academy, might prefer to put equivalent effort and funds into research on synthetic food production, uncomplicated by the vagaries of a sensitive living microorganism.

One cannot in limited space describe in detail the research that goes on in Bob's laboratories. Because his experimentation is quantitative, the equipment in his rooms in the south end of the third floor and in the attic of Patterson Hall reminds one of apparatus in a laboratory of physical chemistry. To be controlled are the duration, wave length, and intensity of light, the temperature, the nutrient medium, and the sterility of cultures. And arrangements must be made for quantitative sampling of the culture from time to time. Radioactive tracers are used in some experiments, with the necessary equipment. Bob does not regard his laboratories as engaged in research on photosynthesis, but he must be as

skilled in light control and measurement as if photobiology were his specialty. A room is being constructed now for the calibration of his light producing and measuring equipment. One corner of one room does look biological, for there he keeps stand-by cultures of green algae growing on agar slants. There were dozens of tubes here containing many species of algae.

How does one tell one species of Chlorella from another? They all look like tiny mottled green spheres, and the cell wall is without characteristic pattern. As among certain bacteria, a physiological classification is more useful than a morphological one. Bob now has a Japanese student, Miss Ikuko Shihira, who is working on the physiological classification of the species of this genus, which live in both fresh and salt water. I wondered whether the American Type Culture Collection here in Washington has a comprehensive collection of green algae. Bob says they have only a few; the best collection is at Indiana University.

Chlorella farming is not the only possible practical application of green algae. Some attention has been given to the use of algae to assist in the purification of the effluent from sewage treatment plants. And since bioastronautics became a subject for serious study, work is being done on the use of algae for adding oxygen to and removing carbon dioxide from space vehicles. Also, increasing attention is being paid to biological oceanography, in which the physiology and ecology of plankton, "the grass of the sea," are important. All these subjects are connected with Bob Krauss and his laboratories.

It was heartening to see him at the height of his powers, well supported financially both by granting agencies and his own university, attracting good students whom he will train in basic research, carrying his message outside his own campus not only through his publications but by invitational lectures, and finally acting like a good citizen of the Washington Academy of Sciences as adviser to serious high school students who want to use algae in their science fair projects. May he continue to have the courage and the wisdom to say no! whenever attempts are made, as they will be, to lure him away from his principal objective—to learn more about the physiology of algae!

—Frank L. Campbell

SCIENCE AND DEVELOPMENT

The International Geophysical Year investigations have yielded tons of records of data on earth, sea, air, and space. More than 15 tons of records are now on hand from the Antarctic alone. Many years will be required for their study and digestion. According to the most recent annual report of the Smithsonian Institution, this vast accumulation of data results from the work of between 20,000 and 30,000 scientists of 66 nations in "the greatest cooperative enterprise for peaceful purposes in all human history." A number of outstanding discoveries have been made. Many more doubtless will come in the future from the gradual assimilation of the data.

The National Bureau of Standards has established two new Technical Advisory Committees, one on Calibration and Measurement Services, and one on Enginering and Related Standards. The purpose of the committees is said to aid the Bureau in cooperating with industry in the fields of precision measurement, calibration, and standard practices. They include leaders in specialized fields drawn from industry. These committees are in addition to a group of technical advisory panels composed of representatives of leading professional scientific and engineering societies that advise various technical divisions of the Bureau.

The mechanism by which hydrogen atoms are removed from ethane during vacuum ultraviolet photolysis has been determined at the National Bureau of Standards. This finding is a product of the basic research program of the Physical Chemistry Division. By means of spectrographic analysis of deuterated samples, H. Okabe and J. R. McNesby (a member of the Washington Academy of Sciences) showed that two hydrogen atoms are usually split from a single carbon atom to form a hydrogen molecule. Ethylidene, which is produced simultaneously, reacts further to form higher hydrocarbons found in the products.

Georgetown University has received research and education grants amounting to $222,860. The Very Reverend Edward B. Bunn, S. J., University president, announced on December 31 the award of $162,060 by the Department of Health Education and Welfare for medical and dental research; $50,800 by the National Science Foundation for support of a "Summer Institute in Mathematics for High School Teachers of Mathematics"; and a number of smaller grants.

A specialized digital computer for use as a research tool on the possibilities of an automatic weather station has been developed by the National Bureau of Standards in cooperation with the U. S. Weather Bureau. AMOS (Automatic Meteorological Observation Station) IV, the computer, receives and processes data from weather-sensing instruments and transmits the results via teletype to a central forecasting station and to airport weather stations. Automatic weather stations could be widely distributed, and would be especially useful in relatively inaccessible locations that are important sources of early data on meteorological activity.

Food and Drug Administration has seized over 1,900 tons of soybeans for contamination with poisonous Crotalaria seeds in more than 30 Federal Court actions in Virginia and North Carolina. Crotalaria is used as a soil-improving crop for sandy soil in the Southeastern States. Seed from volunteer Crotalaria plants growing in soybean fields become mixed with soybeans during harvest. Presence of Crotalaria seed in feed has been reported to cause mortalities in poultry flocks. Food and Drug scientists found that as little as three seeds per pound of feed causes retarded growth in rats. Crotalaria seeds are about one-third the size of soybeans and can be removed by sifting.

A new National Meteorological Experiment Center has been established at Sterling, Virginia, by the Weather Bureau, U.S. Department of Commerce. It occupies a 400-acre site, 25 miles west-northwest of Washington near the Dulles International Airport. The Center will conduct field tests to evaluate the accuracy, adaptability and reliability of experimental meteorological observational instruments. It will also be responsible for taking upper air and solar radiation observations for the Washington area. In addition, it will assist various Weather Bureau divisions in obtaining data in various fields of geophysical research and data for other government agencies.

United States scientists now may easily have their unused publications transferred to Latin American libraries. A new program for transfer has been organized by the Division of Science Development of the Pan American Union. Under this program, Latin American libraries are being urged to become members of the U.S. Book Exchange (USBE), a nonprofit corporation established in Washington in 1948, as a central office for exchange of duplicate copies of books and journals between libraries throughout the world. Membership includes about 1800 libraries, more than half of which are in foreign countries. About 1,500,000 items are exchanged annually. Latin American libraries will request journals through regular USBE procedures. If certain items are not available in the USBE files, the Division of Science Development will announce such needs through appropriate professional journals. U.S. scientists may send their unused publications to the U.S. Book Exchange, 3335 V Street, N.E., Washington 18, D.C., or to the Division of Science Development, Pan American Union, Washington 6, D.C. The estimated value and mailing costs may be claimed as income tax deductions.

A Symposium on Large Capacity Memory Techniques for Computing Systems is being sponsored by the Office of Naval Research. It will be held in the Department of Interior Auditorium, Washington, on May 23-25. Attention will be focused on new ideas, research, and developments which may lead to novel computer memories with large capacities. Future advances in computer processing depend to a large extent on the development of new computing memories. Organizations engaged in appropriate research and development activities will be invited to contribute papers. Attendance is open to all interested technical workers.

Biological Sciences Communication Project is the name of a large-scale study to identify and analyze all steps in the flow of biological information from source to user. The study is being made by the American Institute of Biological Sciences under a grant from the National Science Foundation. It is under the direction of Charles W. Shilling. The study will include examination of methods of acquiring, indexing, storing, and retrieving printed scientific literature, needs of biologists for information, use of information, and characteristics of dissemination activities of existing agencies. Also, the effectiveness of visiting biologists' programs, conferences, and symposia will be considered.

Delegates for 1961 to the Washington Academy of Sciences, Representing the Local Affiliated Societies

Philosophical Society of Washington	LAWSON M. MCKENZIE
Anthropological Society of Washington	REGINA FLANNERY HERZFELD
Biological Society of Washington	HERBERT FRIEDMANN
Chemical Society of Washington	JOHN L. TORGESEN
Entomological Society of Washington	WILLIAM E. BICKLEY
National Geographic Society	ALEXANDER WETMORE
Geological Society of Washington	MARGARET D. FOSTER
Medical Society of the District of Columbia	FREDERICK O. COE
Columbia Historical Society	U. S. GRANT, III
Botanical Society of Washington	HAROLD T. COOK
Society of American Foresters	G. FLIPPO GRAVATT
Washington Society of Engineers	HOWARD S. RAPPLEYE
American Institute of Electrical Engineers	WILLIAM A. GEYGER
American Society of Mechanical Engineers	WILLIAM G. ALLEN
Helminthological Society of Washington	DOYS A. SHOSS
Society of American Bacteriologists	MARY LOUISE ROBBINS
Institute of Radio Engineers	ROBERT D. HUNTOON
American Society of Civil Engineers	DOUGLAS E. PARSONS
Society for Experimental Biology and Medicine	KATHRYN KNOWLTON
American Society for Metals	JOHN A. BENNETT
International Association for Dental Research	GERHARD BRAUER
Institute of the Aerospace Sciences	FRANCOIS N. FRENKIEL
American Meteorological Society	JACK THOMPSON
Insecticide Society of Washington	MILTON S. SCHECHTER
Acoustical Society of America	RICHARD K. COOK
American Nuclear Society	URNER LIDDEL